

CLAIMS

1. An electrolyte solution for use in an electrolytic capacitor characterized by comprising a compound having an unsaturated bond-containing chain  
5 which can undergo hydrogen addition in an electrolyte solution comprising 10-80 wt% of an organic solvent and 90-20 wt% water.

2. An electrolyte solution for use in an electrolytic capacitor characterized by comprising a  
10 compound having an unsaturated bond-containing chain which can undergo hydrogen addition in an electrolyte solution comprising 15-80 wt% of an organic solvent and 85-20 wt% water.

3. An electrolyte solution for use in an  
15 electrolytic capacitor according to claim 1 or 2, characterized in that the compound having an unsaturated bond-containing chain is soluble in water, polar solvents or protic polar organic solvents.

4. An electrolyte solution for use in an  
20 electrolytic capacitor according to any one of claims 1 to 3, characterized by comprising at least one type of electrolyte selected from the group consisting of carboxylic acids or their salts and inorganic acids or their salts.

25 5. An electrolyte solution for use in an electrolytic capacitor according to claim 4, characterized in that the concentration of the inorganic acid or its salt in the electrolyte solution is 0.1-15 wt%.

30 6. An electrolyte solution for use in an electrolytic capacitor according to claim 4, characterized in that the concentration of the carboxylic acid or its salt in the electrolyte solution is 3-30 wt%.

35 7. An electrolyte solution for use in an electrolytic capacitor according to any one of claims 1 to 6, characterized in that the compound having an unsaturated bond-containing chain is a compound having a

molecular chain with a carbon-carbon or carbon-nitrogen  $\pi$  bond, such as an alkyne, alkene or imine, and comprising at least one substituent group selected from the group consisting of hydroxyl, formyl, carbonyl, acyl, carboxyl, sulfonfyl, sulfinyl, sulfenyl, amido, amino, alkylamino, dialkylamino, alkoxysilyl, silanol, phenylcarboxyl, nitrile, nitro, nitroso, phenol, phosphono, esters and ethers.

8. An electrolyte solution for use in an electrolytic capacitor according to any one of claims 1 to 7, characterized in that the compound having an unsaturated bond-containing chain is included in an amount of 0.1-10 wt% based on the total weight of the electrolyte solution.

9. An electrolyte solution for use in an electrolytic capacitor according to any one of claims 1 to 8, characterized in that the organic solvent is a protic solvent or an aprotic solvent, or a mixture thereof.

10. An electrolyte solution for use in an electrolytic capacitor according to any one of claims 1 to 9, characterized in that the carboxylic acid or its salt is selected from the group consisting of monocarboxylic acids, dicarboxylic acids, tricarboxylic acids, saturated carboxylic acids and unsaturated carboxylic acids such as formic acid, acetic acid, propionic acid, butyric acid, p-nitrobenzoic acid, salicylic acid, benzoic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, fumaric acid, maleic acid, phthalic acid, azelaic acid, citric acid and hydroxybutyric acid, and their derivatives and ammonium salts, sodium salts, potassium salts, amine salts and alkylammonium salts.

11. An electrolyte solution for use in an electrolytic capacitor according to any one of claims 1 to 10, characterized in that the inorganic acid or its salt is selected from the group consisting of inorganic

acids and inorganic acids having a carbon chain like alkyl, such as phosphoric acid, phosphorous acid, hypophosphorous acid, boric acid, sulfaminic acid and alkylphosphoric acids, and their ammonium salts, sodium salts, potassium salts, amine salts and alkylammonium salts.

12. An electrolyte solution for use in an electrolytic capacitor according to any one of claims 1 to 11, characterized by further comprising at least one compound selected from among the following groups: (1) chelate compounds (2) saccharides, (3) hydroxybenzyl alcohols and/or L-glutamic acid diacetate or their salts, (4) gluconic acid and/or gluconic lactone and (5) nitro or nitroso compounds.

13. An electrolytic capacitor characterized by comprising the electrolyte solution according to any one of claims 1 to 12.

14. An electrolytic capacitor characterized by employing an electrolyte solution comprising a solvent composed of 10-80 wt% of an organic solvent and 90-20 wt% water, and by including therein a compound with an unsaturated bond-containing chain which can undergo hydrogen addition.

15. An electrolytic capacitor characterized by employing an electrolyte solution comprising a solvent composed of 15-80 wt% of an organic solvent and 85-20 wt% water, and by including therein a compound with an unsaturated bond-containing chain which can undergo hydrogen addition.

16. An electrolytic capacitor according to claim 14 or 15, characterized in that the compound with an unsaturated bond is a compound having a molecular chain with a carbon-carbon or carbon-nitrogen  $\pi$  bond, such as an alkyne, alkene or imine, and comprising at least one substituent selected from the group consisting of hydroxyl, formyl, carbonyl, acyl, carboxyl, sulfonyl, sulfinyl, sulfenyl, amido, amino, alkylamino,

dialkylamino, alkoxysilyl, silanol, phenylcarboxyl, nitrile, nitro, nitroso, phenol, phosphono, esters and ethers.

5           17. An electrolytic capacitor according to any one of claims 14 to 16, characterized by employing an electrolyte solution comprising a solvent composed of 10-80 wt% of an organic solvent and 90-20 wt% water, and having the compound with an unsaturated bond-containing chain present on the electrode surface.

10           18. An electrolytic capacitor according to any one of claims 14 to 16, characterized by employing an electrolyte solution comprising a solvent composed of 15-80 wt% of an organic solvent and 85-20 wt% water, and having the compound with an unsaturated bond-containing chain present on the electrode surface.

15           19. An electrolytic capacitor according to claim 17 or 18, characterized in that the compound with an unsaturated bond-containing chain is adhered to or thoroughly permeated into the electrolyte surface by coating or electrolyte solution immersion.

20           20. An electrolytic capacitor according to any one of claims 14 to 19, characterized by employing an electrolyte solution comprising a solvent composed of 10-80 wt% of an organic solvent and 90-20 wt% water, and including the compound with an unsaturated bond-containing chain in the separator of the electrolytic capacitor.

25           21. An electrolytic capacitor according to any one of claims 14 to 19, characterized by employing an electrolyte solution comprising a solvent composed of 15-80 wt% of an organic solvent and 85-20 wt% water, and including the compound with an unsaturated bond-containing chain in the separator of the electrolytic capacitor.

30           22. An electrolytic capacitor according to claim 20 or 21, characterized in that the compound with an unsaturated bond-containing chain is adhered to or

thoroughly permeated into the separator by coating or electrolyte solution immersion.

5        23. An electrolytic capacitor according to any one of claims 13 to 18, characterized in that the content of the compound with an unsaturated bond-containing chain in the electrode foil is  $0.01 \text{ mg/cm}^2$  to  $1 \text{ mg/cm}^2$  (projectional area).

10       24. An electrolytic capacitor according to any one of claims 13 to 23, characterized in that the content of the compound with an unsaturated bond-containing chain in the separator is  $0.01 \text{ mg/cm}^2$  to  $1 \text{ mg/cm}^2$  (projectional area).